

IV. Claim Listing

What is claimed:

1. (Original/Withdrawn) A PCB with internal signal traces on a thin dielectric layer suspended in air between two flat metal plates. Suspension in air is accomplished by indentation of the flat metal plates above and below the trace and a distance away from the edges of the trace, leaving the remainder of the metal away from the indentation to act as a spacer. The indented area is referred to as a "channel". See FIG. 1 for orthogonal view and FIG. 2 for end-on view.
2. (Original/Withdrawn) The PCB of claim 1 fabricated by removal of material in the metal plate by etching, milling, punching or shaping or any other method.
3. (Original/Withdrawn) The PCB of claim 1 fabricated by adding material to the metal plate using but not limited to plating, welding, electro-plating, painting, spraying, or assembly or any other metal build-up process.
4. (Original/Withdrawn) The PCB of claim 1 fabricated by assembling a combination of metal plates with at least one plate essentially electrically continuous over the assembly, and at least one metal spacing plate with metal removed from the trace area to keep from shorting the signal. The metal spacing plate(s) may be made by etching, milling punching or any process.
5. (Original/Withdrawn) The PCB of claim 1 fabricated by shaping of material in the metal plate by but not limited to stamping, drawing or other process. The ridges and valleys of one side can become the valleys and ridges of the opposite side, for the next layer stacked.
6. (Original/Withdrawn) The PCB of claim 1 fabricated by casting, molding, electro-

forming or any similar process to make the metal plate in the desired shape. The ridges and valleys of one side can become the valleys and ridges of the opposite side, for the next layer stacked.

7. (Original/Withdrawn) The PCB of claim 1 with dielectric layer strong enough to support the trace between the spacing layers but thin enough to minimize the effect it will have on the composite dielectric constant including the air between the trace and the external conductive planes.

8. (Original/Withdrawn) The PCB of claim 1 wherein several traces may be used on the same dielectric layer in individual channels.

9. (Original/Withdrawn) The PCB of claim 1 wherein several traces may be placed within a single channel.

10. (Original/Withdrawn) The PCB of claim 1 wherein two traces may be placed to operate as a differential pair of signals.

11. (Original/Withdrawn) The PCB of claim 1 wherein Multiple layers are stacked so that many traces can be routed in the same PCB.

12. (Original/Withdrawn) Single metal plate of claim 1 may have metal indentation on the opposite surface so that the plate serves two different signal traces, one above and one below.

13. (Original/Withdrawn) The PCB of claim 1 will be 4 or 5 millimeter thick spacers, conductive layers will be about 1 millimeter thick, copper trace will be about 1 millimeter thick and the overall section will be about 12 millimeters.

14. (Original/Withdrawn) The PCB of claim 1 wherein channels in the metal plates noted above may be extended to the edges of the PCB or to holes to the surface to provide for air

escape or inflow if temperature or altitude changes might cause compression or expansion of trapped air and de-lamination.

15. (Original/Withdrawn) The PCB of claim 1 wherein attachment of vias for traces of claim 1 may be by (1) removing the dielectric layer with signal trace, (2) drilling a hole larger than the via in the metal plates and spacers, (3) forcing dielectric material into the drill hole in the metal plates individually, (4) laminating the layers together, (5) drilling a smaller via hole through the dielectric material and the pads on the signal trace, and (6) plating to connect the via to the signal trace as is normally done.

16. (Original/Withdrawn) The PCB of claim 1 wherein attachment of vias of claim 1 may be done using several techniques including the insertion of dielectric spacers or metal pins to electrically connect and to position the connection via.

17. (Original/Withdrawn) The PCB of claim 1 wherein laminating metal to metal may use an adhesive coating or an adhesive sheet. The adhesive will have no effect on electrical high speed performance because the thin dielectric of the adhesive with wide metal plates forms a high frequency capacitive short from top to bottom plates.

18. (New) A printed circuit board comprising:

A plurality of internal signal traces located on a dielectric layer,
wherein the dielectric layer is suspended in air between two flat metal plates.

19. (New) The printed circuit board of claim 18 further comprising open air channels located in the flat metal plates above and below at least one of the signal traces.

20. (New) The printed circuit board of claim 19 wherein the width of open air channels are wider than at least one of the internal signal traces.

21. (New) A method of manufacturing a printed circuit board that contains a plurality of internal signal traces located on a dielectric layer wherein the dielectric layer is suspended in air between two flat metal plates, comprising:

a. A means for creating open air channels in the flat metal plates above and below at least one of the signal traces.

22. (New) The method of manufacturing a printed circuit board of claim 21 wherein the means for creating open air channels in the flat metal plates above and below at least one of the signal traces comprises etching, milling, punching or shaping the open air channels.

23. (New) The method of manufacturing a printed circuit board of claim 21 wherein the means for creating open air channels in the flat metal plates above and below at least one of the signal traces comprises adding material to at least one of the metal plates.

24. (New) The method of manufacturing a printed circuit board of claim 23 wherein the means for adding material to at least one of the metal plates comprises using a metal build-up process, such as plating, welding, electro-plating, painting, spraying, or assembly.

25. (New) The method of manufacturing a printed circuit board of claim 21 comprising:

a. combining a top plate and a top spacer plate such that the top plate and top spacer plate create an open air channel above at least one internal signal trace located on a dielectric layer,

b. wherein the dielectric layer is suspended in air,

c. combining a bottom plate and bottom spacer such that the bottom plate and bottom spacer plate create an open air channel below at least one internal signal trace located on a dielectric layer, and

d. wherein the dielectric layer is suspended in air.

26. (New) The method of manufacturing a printed circuit board of claim 25 wherein the open air channels in the metal spacing plate(s) are made by etching, milling, or punching the metal spacing plate(s).

27. (New) The printed circuit board of claim 19 wherein the open air channels in the flat metal plates are located above and below at least one of the signal traces.

28. (New) The printed circuit board of claim 19 wherein the open air channels in the flat metal plates allow for air to flow freely through the channel(s).

29. (New) The printed circuit board of claim 19 wherein layers on the printed circuit board are laminated together during manufacture.

30. (New) The printed circuit board of claim 19 wherein air is used as the primary dielectric in order to pass all high-frequency signals without discrimination.

31. (New) The printed circuit board of claim 29 wherein the layers on the printed circuit board are laminated together using an adhesive coating.